

CLAIMS

What is claimed is:

5 1. A centrifugal separator (10, 10A, 10B) which comprises
a screw conveyor (40) inside of a bowl (20), supports them so
as to be relatively rotatable, separates the object to be
treated from a feed stock supplied to the inside of said bowl
(20), and carries out cleaning and deliquidization of said
10 object to be treated with a screen part (30) provided along
the inner circumferential surface at one end of the bowl (20),
a hub (41) of said screw conveyor (40) having a cleaning liquid
receiving part (43) for receiving the cleaning liquid supplied
to the inside of the hub (41) and a cleaning nozzle (45) which
15 jet spouts the cleaning liquid from the inside of the cleaning
liquid receiving part (43) toward said screen part (30),
wherein

a liquid conduction part for jet spouting at least a part
of the cleaning liquid directly toward the residual layer
20 crystals formed in the clearance between the outer
circumferential edge of the flight (42) of said screw conveyor
(40) and the inner circumferential surface of said screen part
(30) is provided.

2. A centrifugal separator (10, 10A, 10B) which comprises
25 a screw conveyor (40) inside of a bowl (20), supports them so
as to be relatively rotatable, separates the object to be
treated from a feed stock supplied to the inside of said bowl
(20), and carries out cleaning and deliquidization of said
object to be treated with a screen part (30) provided along
30 the inner circumferential surface at one end of the bowl (20),
a hub (41) of said screw conveyor (40) having a cleaning liquid
receiving part (43) for receiving the cleaning liquid supplied
to the inside of the hub (41) and a cleaning nozzle (45) which
jet spouts the cleaning liquid from the inside of the cleaning
35 liquid receiving part (43) toward said screen part (30),
wherein

a liquid conduction part for jet spouting at least a part of the cleaning liquid directly toward the residual layer crystals formed in the clearance between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided; and

said liquid conduction part is provided such that at least a part of the cleaning liquid which has been jet spouted holds the thickness of the residual layer crystals penetrated thereby to within 10 mm.

3. A centrifugal separator (10, 10A, 10B) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein

a liquid conduction part for jet spouting at least a part of the cleaning liquid directly toward the residual layer crystals formed in the clearance between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided; and

the tip of at least a part of the cleaning liquid conduction part is located within 10 mm from the inner surface of the screen part (30).

4. A centrifugal separator (10, 10A, 10B) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl

(20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein

10 a residual layer crystal cleaning liquid receiving part (46) for receiving the cleaning liquid for cleaning the residual layer object to be treated formed in the clearance between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided inside of said cleaning liquid receiving part (43), being partitioned independently of the inside of said cleaning liquid receiving part (43); and

15 a residual layer crystal cleaning liquid path is formed along the direction of the helix of said flight (42) for causing the cleaning liquid inside of said residual layer crystal cleaning liquid receiving part (46) to be directly jet spouted toward said residual layer object to be treated from the outer circumferential edge of said flight (42), with no relation to said cleaning liquid receiving part (43).

20 5. A centrifugal separator (10, 10A) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30),

30 35

wherein

a residual layer crystal cleaning liquid receiving part (46) for receiving the cleaning liquid for cleaning the residual layer object to be treated formed in the clearance
5 between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided inside of said cleaning liquid receiving part (43), being partitioned independently of the inside of said cleaning liquid receiving part (43);

10 in the locations where the inner circumferential edges of said flight (42) range, a connection tube (47) is provided at prescribed intervals along the direction of the helix of the flight (42) on the bottom side of said residual layer crystal cleaning liquid receiving part (46), and a cleaning liquid
15 discharge hole (49) which connect to said connection tube (47), being radially extended from the inner circumferential surface side of the hub (41) to the outer circumferential edge of the flight (42) inside the wall of the hub (41) or the flight (42) of said screw conveyor (40), is provided; and

20 the cleaning liquid inside of said residual layer crystal cleaning liquid receiving part (46) is directly jet spouted toward said residual layer object to be treated from the tip opening of said respective cleaning liquid discharge holes (49) which are opened at the outer circumferential edge of said
25 flight (42).

6. A centrifugal separator (10B) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20),
30 and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the
35 inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning

liquid receiving part (43) toward said screen part (30),
wherein

a residual layer crystal cleaning liquid receiving part
(46) for receiving the cleaning liquid for cleaning the
5 residual layer object to be treated formed in the clearance
between the outer circumferential edge of the flight (42) of
said screw conveyor (40) and the inner circumferential surface
of said screen part (30) is provided inside of said cleaning
liquid receiving part (43), being partitioned independently
10 of the inside of said cleaning liquid receiving part (43);

in the locations adjacent to the surface (42b) on the side
opposite to the object-to-be-treated conveying surface (42a)
of said flight (42), a connection tube (47) is provided at
prescribed intervals along the direction of the helix of said
15 flight (42) on the bottom side of said residual layer crystal
cleaning liquid receiving part (46), and in the hub (41) of
said screw conveyor (40), a cleaning liquid connection hole
(48) to which said connection tube (47) is connected is
provided;

20 on the surface (42b) on the side opposite to the
object-to-be-treated conveying surface (42a) of said flight
(42), a cleaning liquid discharge pipe (80) which is connected
to said cleaning liquid connection hole (48), extending in the
radial direction from the inner circumferential edge to the
25 outer circumferential edge of the flight (42), is mounted at
prescribed intervals along the direction of the helix of the
flight (42); and

the cleaning liquid inside of said residual layer crystal
cleaning liquid receiving part (46) is directly jet spouted
30 toward said residual layer object to be treated from the tip
opening of said cleaning liquid discharge pipe (80).

7. The centrifugal separator (10A) of claim 5, wherein,
in the tip surface of the outer circumferential edge of said
flight (42), a channel (49a) which consecutively extends along
35 the direction of the helix of the flight (42), and to which
the tip opening of said respective cleaning liquid discharge

holes (49) is connected is formed.

8. The centrifugal separator (10, 10A, 10B) of claim 4, claim 5, claim 6, or claim 7, wherein, into the inside of the hub (41) of said screw conveyor (40), a feed tube (60) for
5 supplying the feed stock that extends in the axial direction of the hub (41) is inserted;

a cleaning liquid supply path (71) for supplying the cleaning liquid to the inside of said cleaning liquid receiving part (43) is formed inside of said feed tube (60), and at
10 intermediate points on the feed tube (60) that are opposed to said cleaning liquid receiving part (43) in the radial direction, openings of said cleaning liquid supply path (71) are provided; and

a residual layer crystal cleaning liquid supply path (72)
15 for supplying the cleaning liquid to the inside of said residual layer crystal cleaning liquid receiving part (46) is formed inside of said feed tube (60), and at intermediate points on the feed tube (60) that are opposed to said residual layer crystal cleaning liquid receiving part (46) in the radial
20 direction, openings of said residual layer crystal cleaning liquid supply path (72) are provided.

9. A centrifugal separator (10, 10C) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be
25 treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid
30 receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein

35 inside of said cleaning liquid receiving part (43), a plurality of residual layer crystal cleaning liquid discharge

holes (52) which are arranged at prescribed intervals along the direction of the helix of said flight (42) in the locations adjacent to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of the flight
5 (42) of said screw conveyor (40) is provided;

along the outer circumferential edge of the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a cover flight (50) with a small width that extends in the direction of the helix of
10 the flight (42) is mounted with a prescribed spacing being given with respect to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a); and

the cleaning liquid inside of said cleaning liquid receiving part (43) that springs out from said residual layer
15 crystal cleaning liquid discharge holes (52) is directly jet spouted toward the residual layer object to be treated formed in the clearance between the outer circumferential edge of said flight (42) and the inner circumferential surface of said screen part (30) through the clearance between the outer
20 circumferential edge of said flight (42) and said cover flight (50).

10. The centrifugal separator (10C) of claim 9, wherein said cleaning liquid receiving part (43) is provided with a partition plate (43a) which partitions the inside of the
25 cleaning liquid receiving part (43) into two or more in the axial direction in the screen part (30) of said bowl (20) for allowing a particular cleaning range in said screen part (30) to be selected.

11. A centrifugal separator (10D) which comprises a screw
30 conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner
35 circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving

part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30),
5 wherein

a residual layer crystal cleaning liquid receiving part (46) for receiving the cleaning liquid for cleaning the residual layer object to be treated formed in the clearance between the outer circumferential edge of the flight (42) of
10 said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided inside of said cleaning liquid receiving part (43), being partitioned independently of the inside of said cleaning liquid receiving part (43);

inside of the locations adjacent to the surface (42b) on
15 the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a plurality of connection tubes (47) are provided at prescribed intervals along the direction of the helix of said flight (42) on the bottom side of said residual layer crystal cleaning liquid receiving part
20 (46), and in the hub (41) of said screw conveyor (40), a plurality of residual layer crystal cleaning liquid discharge holes (52) to which said respective connection tubes (47) are connected, respectively, are provided;

along the outer circumferential edge of the surface (42b)
25 on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a cover flight (50) with a small width that extends in the direction of the helix of the flight (42) is mounted with a prescribed spacing being given with respect to the surface (42b) on the side opposite to the
30 object-to-be-treated conveying surface (42a); and

the cleaning liquid inside of said residual layer crystal cleaning liquid receiving part (46) that springs out from said respective residual layer crystal cleaning liquid discharge
35 holes (52) is directly jet spouted toward said residual layer object to be treated through the clearance between the outer circumferential edge of said flight (42) and said cover flight

(50).

12. The centrifugal separator (10D) of claim 11, wherein,
into the inside of the hub (41) of said screw conveyor (40),
a feed tube (60) for supplying the feed stock that extends in
5 the axial direction of the hub (41) is inserted;

a cleaning liquid supply path (71) for supplying the
cleaning liquid to the inside of said cleaning liquid receiving
part (43) is formed inside of said feed tube (60), and at
intermediate points on the feed tube (60) that are opposed to
10 said cleaning liquid receiving part (43) in the radial
direction, openings of said cleaning liquid supply path (71)
are provided; and

a residual layer crystal cleaning liquid supply path (72)
for supplying the cleaning liquid to the inside of said residual
15 layer crystal cleaning liquid receiving part (46) is formed
inside of said feed tube (60), and at intermediate points on
the feed tube (60) that are opposed to said residual layer
crystal cleaning liquid receiving part (46) in the radial
direction, openings of said residual layer crystal cleaning
20 liquid supply path (72) are provided.

13. A centrifugal separator (10E) which comprises a screw
conveyor (40) inside of a bowl (20), supports them so as to
be relatively rotatable, separates the object to be treated
from a feed stock supplied to the inside of said bowl (20),
25 and carries out cleaning and deliquidization of said object
to be treated with a screen part (30) provided along the inner
circumferential surface at one end of the bowl (20), a hub (41)
of said screw conveyor (40) having a cleaning liquid receiving
part (43) for receiving the cleaning liquid supplied to the
30 inside of the hub (41) and a cleaning nozzle (45) which jet
spouts the cleaning liquid from the inside of the cleaning
liquid receiving part (43) toward said screen part (30),
wherein

inside of the hub (41) of said screw conveyor (40) on one
35 side thereof, a residual layer crystal cleaning liquid
receiving chamber (54) which receives the cleaning liquid for

cleaning said residual layer object to be treated formed in the clearance between the outer circumferential edge of the flight (42) of the screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided, being partitioned independently of said cleaning liquid receiving part (43);

on the outer circumference of the hub (41) of said screw conveyor (40), a plurality of residual layer crystal cleaning liquid introducing tubes (53) are arranged at prescribed intervals in the circumferential direction of the hub (41), being extended along the axial direction of the hub (41) so as to penetrate through said flight (42), respectively, with one end of the respective residual layer crystal cleaning liquid introducing tubes (53) being connected to the inside of said residual layer crystal cleaning liquid receiving chamber (54);

at intermediate points on said respective residual layer crystal cleaning liquid introducing tubes (53), a plurality of residual layer crystal cleaning liquid discharge holes (53a) which are arranged at prescribed intervals along the direction of the helix of the flight (42) of said screw conveyor (40) in the locations adjacent to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42) are provided;

along the outer circumferential edge of the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a cover flight (50) with a small width that extends in the direction of the helix of the flight (42) is mounted with a prescribed spacing being given with respect to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a); and

the cleaning liquid which has been introduced into said respective residual layer crystal cleaning liquid introducing tubes (53) from said residual layer crystal cleaning liquid receiving chamber (54) and which springs out through said respective residual layer crystal cleaning liquid discharge

holes (53a) is directly jet spouted toward said residual layer object to be treated through the clearance between the outer circumferential edge of said flight (42) and said cover flight (50).

5 14. The centrifugal separator (10, 10C, 10D, 10E) of claim 9, claim 10, claim 11, claim 12, or claim 13, wherein said cover flight (50) is mounted, being provided with a slope with respect to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight
10 (42) such that the clearance is gradually narrowed down from the side closer to said hub (41) to the side closer to the outer circumferential edge of the flight (42), and is mounted through supporting plates (51) which are arranged at prescribed intervals.

15